

312/01

**BIOLOGY (MODULAR)**

**MODULE BI2**

P.M. WEDNESDAY, 16 January 2002

(1 hour 40 minutes)

For Examiner's Use Only

Total Marks	
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Centre Number .....

Candidate's Name (in full) .....

Candidate's Examination Number .....

**INSTRUCTIONS TO CANDIDATES**

Write your centre number, name and candidate number in the spaces provided above.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

**INFORMATION FOR CANDIDATES**

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

**1. Name each of the following:**

- (a) the term applied to a community of organisms together with their habitat; [1]

.....

- (b) the biological relationship between two organisms in which one benefits and the other is harmed but not usually killed; [1]

.....

- (c) the type of plants, such as Marram Grass, adapted to survive very dry conditions; [1]

.....

- (d) the route water takes when it passes through plant tissue via the cell walls; [1]

.....

- (e) a deficiency disease which results in fluid retention as a result of low blood protein levels; [1]

.....

- (f) the ions which move into red blood cells to balance the effects of hydrogen carbonate ions leaving during transport of carbon dioxide. [1]

.....

**(Total 6 marks)**

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2. (a) Single-celled organisms such as *Amoeba* are able to exchange gases with their surroundings but do not have specialised exchange surfaces.

(i) By what process do the materials move into or out of the cell? [1]

.....

(ii) A high ratio of two features of the cell make it possible for this process to cater for the needs of such organisms. State these features. [1]

..... :

- (b) Multicellular organisms such as fish and mammals have specialised respiratory surfaces and ventilating mechanisms.

(i) Give **four** features of specialised respiratory surfaces. [4]

.....

.....

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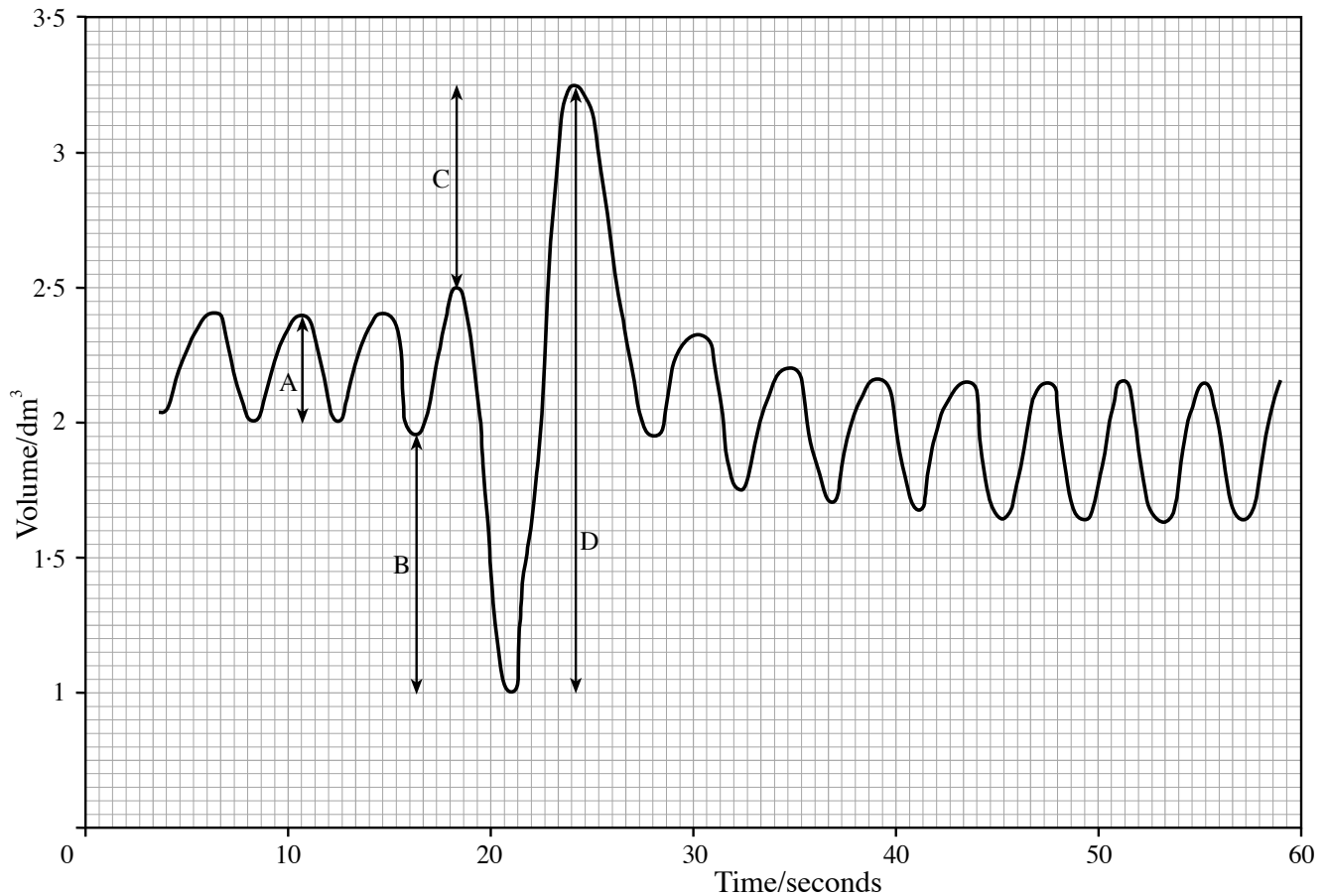
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(ii) What is meant by a ventilating mechanism? [1]

.....

.....

- (c) A spirometer was used to measure a number of different lung volumes of a student. The trace below was obtained by connecting the spirometer to a computer via a position sensor and interface. When the student breathed out the trace moved upwards.



- (i) Complete the table, by using the letters on the trace to identify the lung volumes, and by calculating their values.

<i>Lung volume</i>	<i>Letter identifying</i>	<i>Value</i>
Tidal volume		
Vital capacity		
Inspiratory reserve		

[6]

- (ii) For the last thirty seconds of the above trace the student was resting. If the student had been exercising, give two ways in which the trace would differ from that shown. [2]

.....

.....

- (iii) If the student was suffering from asthma, how would the vital capacity differ from above? [1]

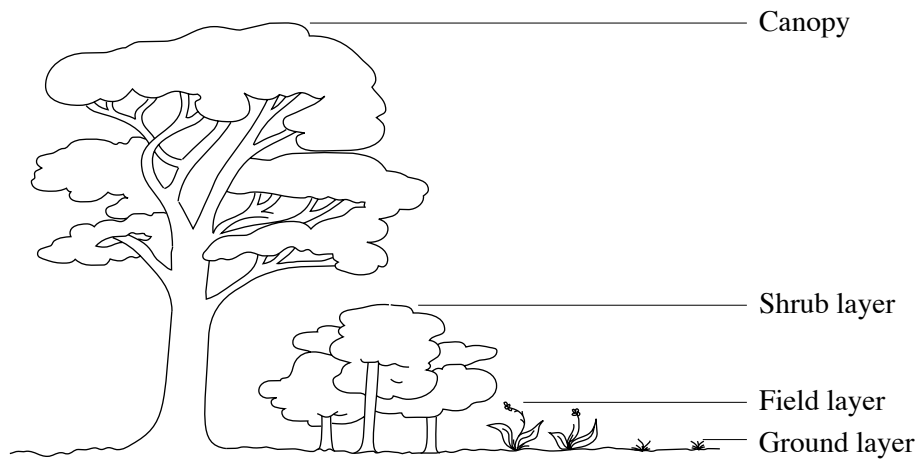
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- (iv) What feature of asthma would be responsible for this difference? [1]

.....

**(Total 17 marks)**  
**Turn over.**

3. (a) The vegetation in mature forests can be classified into the following layers:

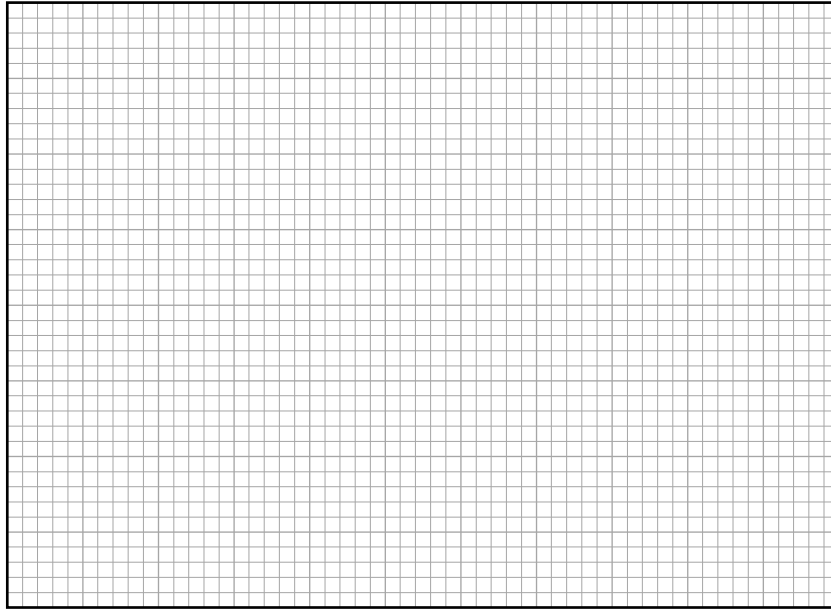


- (i) What term is applied to the final community in a plant succession? [1]  
 .....  
 (ii) Which of the layers, labelled in the diagram, will be the last to form? [1]  
 .....  
 (iii) Describe how two **abiotic** factors will be affected when this layer is completely formed. [2]  
 .....  
 .....

- (b) The table below contains the results of a population study of the common shrew, *Sorex araneus*, in a young **pine tree** plantation on Anglesey. The shrew's main source of food is insects.

<i>Sample date</i>	<i>Population (individuals per acre)</i>
1960	6
1961	7
1962	7
1963	6
1964	1
1965	No data
1966	3
1967	1
1968	1
1969	3
1970	2

- (i) Plot the data as a graph on the grid provided.



[4]

- (ii) The plantation was planted in 1954. By 1963 the canopy was completely closed. How would the following have been affected?

I ground vegetation; ..... [1]

.....

II herbivorous insects; ..... [1]

.....

III shrews. .... [1]

.....

- (iii) Suggest another possible explanation for the large drop in the number of shrews, between 1963 and 1964. [1]

.....

.....

- (c) The trees in deciduous forests lose their leaves each Autumn. Suggest how the population changes in the shrew would have differed from above if the plantation had been a deciduous forest. [2]

.....

.....

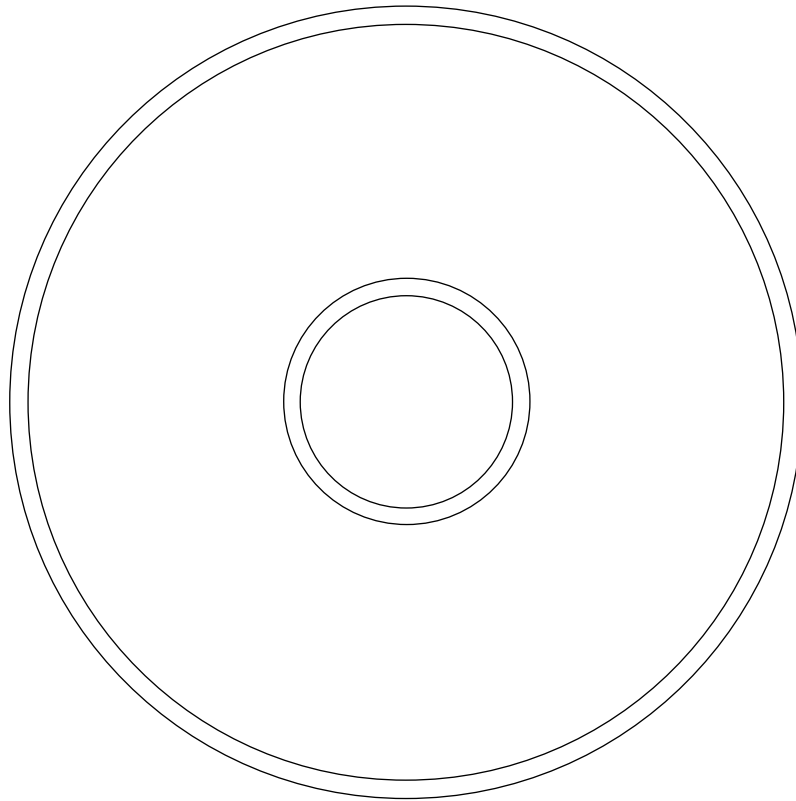
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**(Total 14 marks)**

**Turn over.**

4. The diagram below shows a transverse section of the root of a dicotyledonous plant.



- (a) On the diagram, label the endodermis. [1]
- (b) Complete the diagram by drawing and labelling the xylem and the phloem. [2]
- (c) In the space below,
- (i) Draw a diagram of a single cell from the endodermis of a young root. [1]
- (ii) Annotate your drawing to explain the function of endodermis cells in the uptake of water. [3]



(d) Describe how nitrogen moves from the soil to the xylem of the root.

[3]

.....

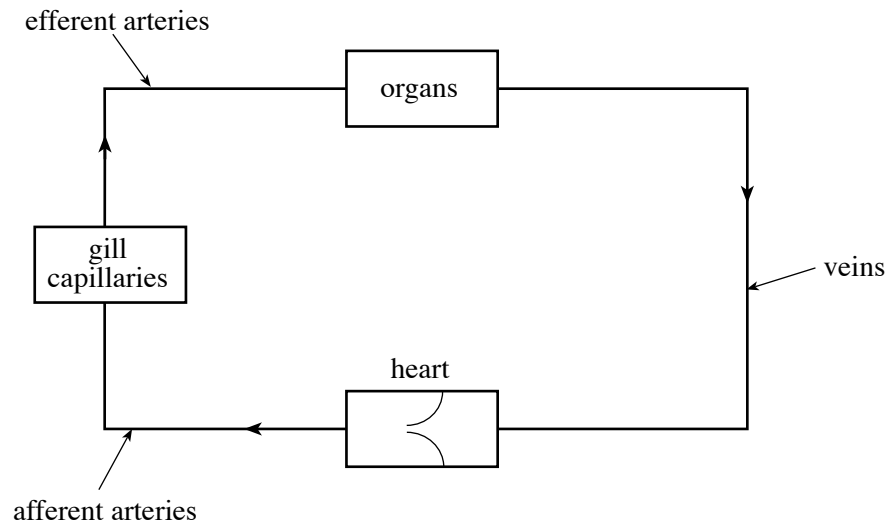
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**(Total 10 marks)**

5. The diagram below shows the blood supply to the gills and other organs of a fish.



- (a) (i) Complete the table, to compare blood flow in the different types of vessel. [1]

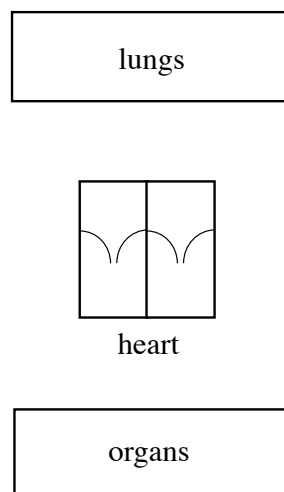
<i>Vessel</i>	<i>Speed (fast/slow)</i>	<i>Pressure (high/low)</i>
Afferent arteries		
Efferent arteries		

- (ii) Which of the **labelled** blood vessels carry blood which is most oxygenated?

.....

[1]

- (b) (i) Complete the diagram below to show the arrangement of arteries and veins in the mammalian circulatory system. [2]



- (ii) On your completed diagram, label the four major blood vessels.

[2]

(c) Why do the walls of arteries contain more muscle tissue than the walls of veins? [2]

.....

.....

(d) (i) Cardiac muscle is said to be myogenic. What does the term myogenic mean? [1]

.....

(ii) Contraction of the cardiac muscle is co-ordinated by three components. The sinoatrial node (SAN), the atrioventricular node (AVN), and the Purkinje Tissue. Describe the role of the following. [2]

SAN .....

.....

Purkinje Tissue .....

.....

**(Total 11 marks)**

6. The size of a population depends on birth rate, death rate, immigration and emigration.

- (a) Arrange these terms into an equation which applies to a population which is neither increasing nor decreasing. [1]

..... + ..... = ..... + .....

- (b) The fishing industry operates by harvesting biomass from natural ecosystems. It is important that this harvesting is sustainable.

- (i) What is meant by the term sustainable in this context? [1]

.....

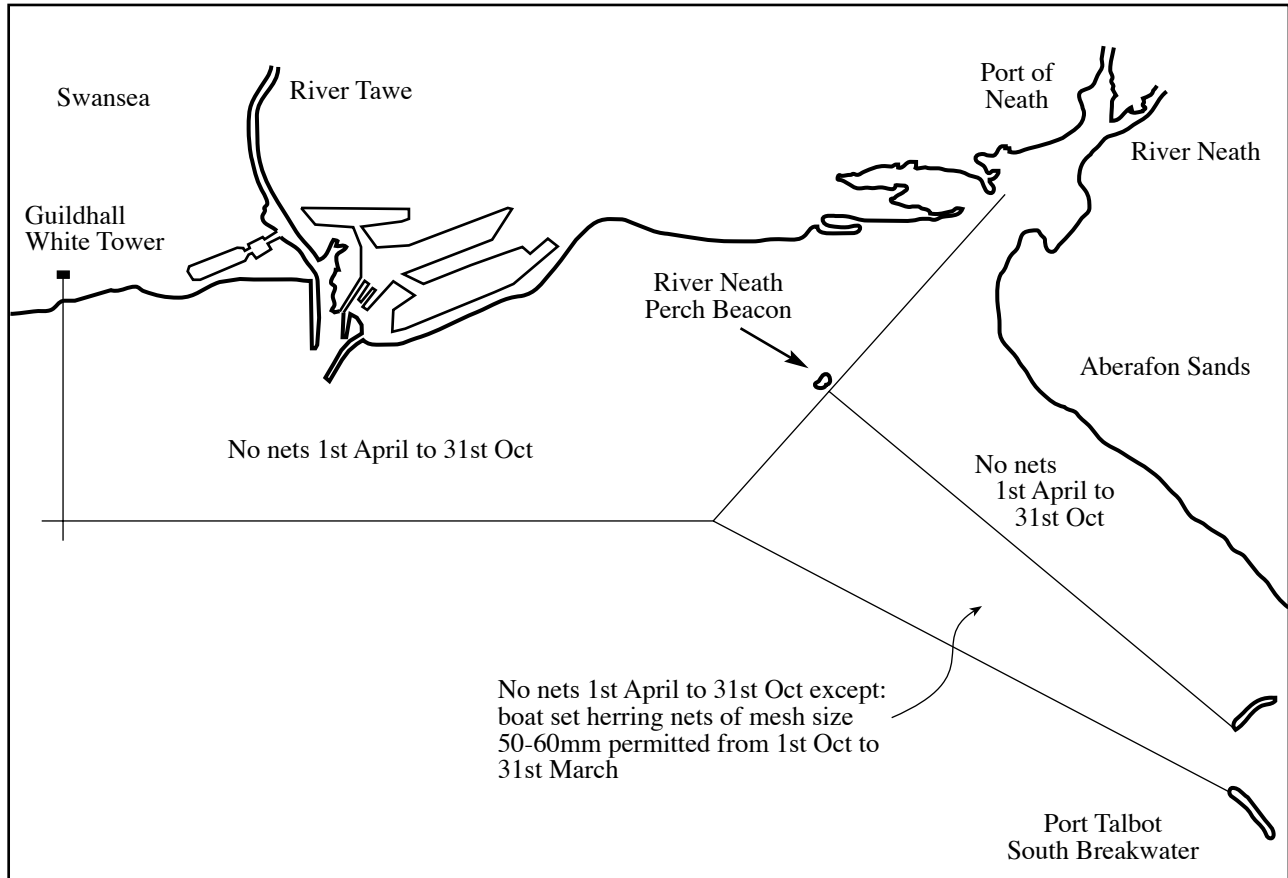
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- (ii) What is meant by the term overfishing? [1]

.....

.....

- (c) There are twelve Sea Fisheries Committees (SFCs) which regulate sea fisheries around the coast of England and Wales. SFCs are empowered to make by-laws for the conservation of their fisheries. The map illustrates some of the by-laws of the South Wales Sea Fisheries Committee.



- (i) Suggest why no nets are permitted between 1st April and 31st October. [1]
- .....
- (ii) What is the **minimum** mesh size of 'boat set herring nets' in sector B? [1]
- .....
- (iii) Why does the SFC impose limits on the mesh size of the nets? [1]
- .....
- (iv) Give **one other** method the SFC might use to attempt to conserve fish stocks. [1]
- .....

(Total 7 marks)

Turn over.

**Either,** (a) Describe how energy flows through ecosystems. [10]

**Or** (b) Describe how nitrogen is cycled in the biosphere. [10]

**(Total 10 marks)**

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**Turn over.**

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